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COMMUNICATIONS

CONJUNCTIVAL PEMPHIGUS

BY

M. H. WHITING

LONDON

UNDER the above heading an article by the late D. J. Wood of Cape Town appeared in the *Brit. Jl. of Ophthal.*, March, 1921. The full details should be read in the original article, but a brief résumé may be given here.

L. H., a Jew, age 19 years, came to Mr. Wood in July, 1916, having been treated as trachoma for many years. He had had pemphigus of the skin as a young child but this had cleared up. Vision in the right eye was very defective and the left eye was practically blind, the cornea being opaque. The right cornea was hazy and full of vessels and there was much conjunctival shrinking.

With mild non-irritating treatment the right eye improved and eventually saw 6/24 but the left eye became gradually worse.

Attempts at grafting new conjunctiva round the cornea were mainly unsuccessful. Covering the eyes was resorted to on several occasions and this measure seemed to do most good. Mr. Wood kept him under observation for three years. The vision in the right eye improved to 6/24. Subsequently L. H. went to Johannesburg where he worked as masseur at a hospital. The

sight became worse and eventually he came to England to see if anything could be done to prevent complete blindness.

He was sent to me by the National Institute for the Blind early this year and I took him into Moorfields. The vision was then, right eye counting fingers at 1 metre, and left eye, hand movements. The conjunctiva was contracted on the right side but there was still a definite upper and lower fornix. The cornea was opaque at the edges and very hazy in the centre. In the left eye the cornea was moderately opaque all over; there was a fair fornix above but none below, only about 3 mm. of conjunctiva separating the limbus from the lower lid margin. He had for some time found that the insertion of a little vaseline between the lids improved the vision for an hour or so and he always carried some with him and put it in at frequent intervals during the day.

I kept him under observation at Moorfields and during this time Mr. Briggs, the Senior Resident Officer, suggested using a contact glass filled with liquid paraffin instead of saline. This was tried by Mr. Phillips who, together with Miss Mann, has been working on the use of contact glasses. The result was sufficiently promising to continue the trial. The sight in the right eye was considerably improved when the contact glass was in position and the condition of the cornea was beneficially affected. Owing to the fact that the contact glass was a stock one and did not fit well the paraffin tended to leak.

It was not possible to fit a contact glass to the left eye owing to the absence of a lower fornix and I decided to try to make one with a mucous membrane graft from the lip. A vertical incision was made down from the outer canthus and a horizontal one along the inner lip of the margin of the lower lid leaving the frill of conjunctiva 3 mm. wide attached to the limbus. The horizontal incision was deepened so that the lid could be turned down on the cheek. A mucous membrane graft was then cut from the lower lip, an operation which was much facilitated by a clamp made for me by Messrs. Weiss like an entropion clamp but about double the size. The graft was transferred to the eye and sutured to the lid margin and the narrow frill of conjunctiva with No. 0 silk. The lid was then turned back to its original position and the vertical incision was sutured. A mould of stent was placed in the new fornix and a dressing was fixed over with strapping and bandage. The stent mould was not removed for a week and after that no dressing was employed.

A good fornix resulted and it was soon possible to fit a contact glass to the left eye also. Since then special contact glasses have been made for each eye with correspondingly better results. He has been under observation for about three months since the operation and has now returned to South Africa. The graft has remained fresh and apparently healthy with no contraction.

The vision in the right eye with the contact glass was 6/24 and on one occasion 6/18 partly and in the left eye nearly 6/60. He is able to read J.6 or a little more.

It seems that the use of contact glasses with liquid paraffin provides a valuable method of treating these otherwise hopeless cases and of improving their vision. The mucous membrane graft not only made the application of a contact glass to the left eye possible but also seemed to improve the general condition of the eye. I wish to express my indebtedness to Mr. Briggs for his original suggestion and to Mr. Phillips for his care and skill in carrying it out.

SOME CASES OF PARALYTIC SQUINT

BY

P. G. DOYNE

LONDON

GENERALISATIONS are attractive but perhaps at times dangerous. With regard to squint especially this may be so. With true concomitant squint I have always felt that the essential defect was in the central control and not primarily in any peripheral factor, although local conditions of the eyes themselves, as, for example, anisometropia, might decide which eye was used to fix with. That certain factors, in particular accommodative strain and psychological stress, caused the central control defect. That, in effect, concomitant squint was a posture conditioned by these factors.

Heterophoria, on the other hand, has seemed to me to be of an exactly opposite nature. That in this condition the defect was local and was for the most part held in check by the central control, only appearing as a naked eye defect when the central control was relaxed, or fatigued.

The following slogan seemed applicable: that in concomitant squint the more concentrated the gaze the more the squint; in heterophoria the more concentrated the gaze the less the squint.

There appears to me to be a certain resemblance between amblyopia and the fusion faculty. Amblyopia may be congenital or acquired; and the fusion faculty may be congenitally absent, or suppressed by disuse.

The fact that in so many cases of squint the fusion faculty will try to find an outlet by the development of "false correspondence," or by means of rapid alteration of the eyes, suggests a thwarted faculty rather than a defective one in the first place.

With the more elaborate investigations of squint now made possible by the synoptophore, I have been surprised how often there appears to be some muscle weakness—an incomitance. In consequence, a follow-up of cases of congenital or early infantile paralytic squint with particular reference to the synoptophore findings I thought would prove of interest. I aimed to get cases from the age of about eight years and upwards, so that the paralysis would have been present for at least seven years. I found it most difficult to collect these cases. I suppose that after the presence of a paralysis has been established they have not been pressed to attend hospital further and in the course of years, having probably changed their address, they become untraceable. I have collected eight cases in all, though two of these are under the stipulated age.

1. *Jean H., aged 10 years.*—Paralysis of right external rectus since birth.

Vision: *R.* $\bar{c}$ $\frac{+2{\cdot}0 \text{ D. sph.}}{+2{\cdot}0 \text{ D. cyl.}}$ 6/12. *L.* $\bar{c}$ +4·0 D. sph. 6/5.

Holds head slightly rotated to the right.

(*a*) With head rotated in this way eyes are parallel.

Synoptophore findings:

Simultaneous macular perception ...	at 0.
Fusion	at 0.
Some stereopsis	at 0.

(*b*) With head held straight R.E. converges 12°.

Synoptophore findings:

Simultaneous macular perception ...	12° C.
Fusion	12° C.
Some stereopsis...	12° C.

R.E. suppresses very readily and its vision has varied from 6/18 to 6/9.

2. *Patricia B., aged 14 years.*—Since early infancy paralysis right external rectus.

Vision: *R.* 6/6. *L.* 6/6.

Diplopia on turning eyes to right.

Holds head rotated to right.

Synoptophore findings: with head rotated:—

Simultaneous macular perception ...	at 0.
Fusion	at 0.
Some stereopsis	at 0.

3. *Henry B., aged 11 years.*—Right eye, defective lateral movement since birth.

On *R.* abduction, R.E. proptosis slightly.

On *L.* abduction, R.E. converges slightly and retracts slightly.

Vision: *R.* $\bar{c}$ $\frac{+1{\cdot}0 \text{ D. sph.}}{+0{\cdot}5 \text{ D. cyl.}}$ 6/6. *L.* $\bar{c}$ +2·0 D. sph. 6/6.

Holds head slightly rotated to the right.

(With left eye fixing, right eye is convergent 6°) but in practice he rotates head to R. and by diverging L.E. obtains parallelism.

In this position:—

Synoptophore findings:

Simultaneous macular perception ...	at 0.
Some fusion	at 0.
Easily relapses to false projection ...	3° to 5°.

(*b*) With *R.E.* fixing, L.E. converges 31°.

Synoptophore findings:

True correspondence, objective and subjective angle, the same.

4. *Ronald B., aged 10 years.*—Left abduction defective but not quite absent—since birth.

Diplopia on looking to left.

Rotates head slightly to left.

Synoptophore findings:

When head rotated to left ...	S.M.P. at 0.
When head not rotated ...	S.M.P. at 7°C.

Suppresses very readily.

5. *Jane M., aged 37 years.*—Bilateral paralysis both external recti since ten months of age.

Vision: *R.* $\bar{c}$ +3·0 D. cyl. 6/9. *L.* $\frac{+1{\cdot}0 \text{ D. sph.}}{+2{\cdot}5 \text{ D. cyl.}}$ 6/9.

Both eyes convergent 30°.

Head held with both eyes convergent.

On fixation (prefers L.E. but will fix with R.E.) rotates head in interest of fixing eye (*e.g.*, to L. if L.E. is fixing).

In this case there is a complete harmonious false correspondence (60° of false correspondence).

6 and 7. *Angela K., aged 3 years. Helen M., aged 3½ years.*—Both cases have paralysis of the left external rectus.

Both hold their heads slightly rotated to the left and in this position the eyes appear parallel.

8. *Grace P., aged 9 years.*—R. ptosis and R. superior rectus paralysis since birth.

Vision: *R.* $\bar{c}$ +2·5 D. sph. 6/5. *L.* $\bar{c}$ +2·5 D. sph. 6/5.

With *L.E.* fixing. *R.* −15° divergence.
10° L/R.
3° in-cyclophoria.

Marked suppression with either eye.

No conclusions can be drawn from these few cases. There are points of interest. In the first four cases there is a marked similarity of practice. All four children rotate their heads in the interest of parallelism and in the rotated position have a fairly good, though not fully developed, fusion.

No false correspondence has developed except in one case—H. B., who tended to slip 3°.

The two little girls, *cases 6 and 7*, were too young for satisfactory synoptophore readings, but they appear to be developing along the same lines as the first four.

Case 5, with bilateral abduction paralysis, has developed a complete false correspondence and in this manner attempts to express her binocular sense.

Case 6, with the vertical paralysis, makes no attempt at binocular function, and does not posture.

My thanks are due to Miss Pugh, who very kindly worked out all the synoptophore findings.

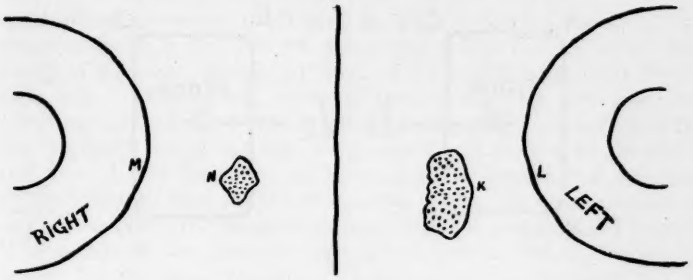
"BILATERAL MESIAL SUPERFICIAL DEFICIENCY OF THE SCLERA"

BY

BASIL GRAVES

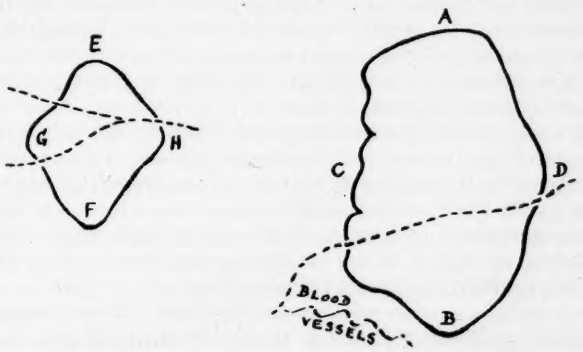
IN "The Eye and its Diseases," edited by Dr. Conrad Berens (Messrs. Saunders & Co., 1936), I briefly indicated in Fig. 184, H., p. 467 (and referred in the footnote at the bottom of page 468), to a condition which sometimes conveys, at the first casual glance, a suggestion of a tenotomy of the internal rectus having been performed in the past, due to a small sharply defined area where the sclera looks thinned, appearing usually less white than the surrounding scleral tissue. One or two colleagues have asked me for details of this condition. Magnified inspection reveals what is exemplified in Fig. 1 and Fig. 2 (which is Fig. 1 enlarged) and Fig. 3.

The optical appearance of these deficiencies is characteristic. If (Fig. 4) the focused small illuminating beam is directed through the over-lying conjunctiva into the middle of the depression (*i.e.*, obliquely on to the floor, as in), the edge AB, as seen through the over-lying conjunctiva, is displayed as a refractile sharply defined limit to what appears to be a superficial defect of the sclera (see Fig. 3, z, which is conjectural); the sides AC and BD are less evident and the side CD is only very faintly evident.



CASE 1

FIG. 1.



RIGHT CASE 1 LEFT

FIG. 2.

CASE 2

FIG. 3.

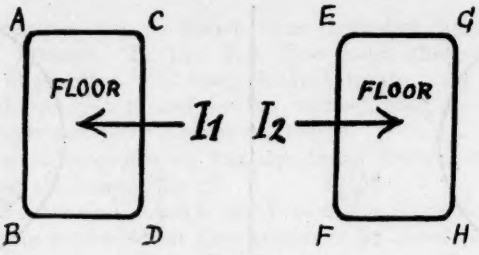


FIG. 4.

If the beam is directed on to the floor of a same depression obliquely from the direction I_2, the side GH is very visible, the sides EG and FH are less visible and the side EF is faintly visible. This appearance, suggesting an abrupt step-like limitation of the thin area, seems common to all the cases I have seen, though it is not necessarily displayed with equal intensity all round the margin of any given defect. (The greater visibility of the edge towards which the impinging beam is directed by "proximal illumination" is simply due to the transmitting and diffusely reflecting internal properties of the deeper laminated scleral tissue.) To summarise this paragraph, the visible definition of the bounding-edge varies relatively with the conditions of illumination; and what is, under constant conditions of illumination, interpretable as the absolute or structural definition of the bounding edge may vary in different cases and in different parts of the same case.

Case 1 is from a lady aged about 70 years. The distance M to N (Fig. 1) is 3·5 mm., and L to K 2·9 mm., M and L being estimated as at the peripheral edge of the arcus pinguiculus (arcus senilis) which is a convenient landmark for limbus measurements, representing the edge of Bowman's membrane. The measurements of the defects in this case (see the enlarged Fig. 2) were: A—B, 4 mm., C—D, 2·5 mm., E—F, 2 mm., G—H, 1·7 mm. The diagram shows samples of the conjunctival vessels running undisturbed across the scleral defects.

I should explain that I made various records of observations on the eye in the years 1921 to 1926; about 1926, on moving my abode, I destroyed most of these unpublished. I can recall having made in those years records of three such cases which I regarded as developmental defects. I cannot now give details of those cases. For many years after that I made no detailed records of cases but recently I have resumed doing so and I have observed four more cases of this defect of the sclerotic, the first being the one which I referred to briefly in Dr. Berens' book, the next being a very pronounced case of which I made no record, the next being the case of Figs. 1 and 2, and the last case being that of a lady,

aged about 60 years, illustrated in Fig. 3 (as " Case 2"). The distance from S to Y is 3·6 mm., and from V to X is 3·4 mm. P—Q is 2·7 mm., R—S, 1·7 mm., T—U, 1·26 mm., and V—W, 0.74 mm. This patient came to me saying that she had been given my name by a doctor in another part of the country and that she " wanted her eyes tested for glasses." I dealt with the matter and after I had finished she very casually introduced a remark about " a dark spot on the inner side of the left eye " which she had noticed only for the past six months. On inspection I found it to be a case of this characteristic scleral defect (Fig. 3, PQRS). I looked for the same condition in the right eye also and did not find it. The patient then casually asked if it " could be anything growing." She bore a family-name of old historic interest and was of a calm, intrepid and self-reliant demeanour. I have heard this question asked relatively often in recent years (three people since January, 1937, have asked me if their stye, or chalazion, is the beginning of cancer), and the remark, particularly in the tone in which it was interjected by this patient, struck me as unimportant; I replied that the condition was nothing more than a developmental defect which had been there since pre-natal days and that it is one which is usually bilateral. The patient replied that in her case it was bilateral, so I looked again and on more careful inspection found a small and faintly evident defect, TUVW, in the right eye also. She replied that the " dark areas " were more noticeable at some times than at others, but that neither of them had been remarked by her or her friends until six months previously. I explained to her that the thinning of the outer coat of the eye had certainly been there always and that if the areas had become evident to her only lately it was perhaps because some overlying fatty tissue might have become thinner or more dilute; and that the variation in appearance might also depend on the degree of vascular congestion of the dark ciliary body beneath the thin floor of each defect. I made a record of the case before the patient left, as I had already decided that I would report the condition some day. About a week later the doctor communicated with me and told me that before she came to me he had given her my name in response to her request for the name of another eye specialist to whom to go for a second opinion because she had just been to someone else who had told her that she had a sarcoma growing in the left eye and that the eye must be enucleated forthwith; and she had arranged with her doctor that neither he nor she should tell me about this previous opinion. She acted the part well and gave me no inkling that I was not the first person she had seen. I was informed that the disclosure of the opinion I gave was not received with tranquility and I now think it worth reporting these cases. Even if this condition occurred, as is doubtless possible, in one

eye only instead of in both, the very definite appearance on careful inspection of the defect—superficial and *in intaglio*—is not such as to suggest that it is caused by an eroding eruption from beneath. I am not aware of this condition having been reported before. A full title might justifiably be suggested as "developmental bilateral mesial superficial intagliated deficiency of the sclera."

DIVERGENT STRABISMUS*

BY

MISS E. E. CASS

LONDON

THE literature on the subject of convergent concomitant strabismus is redundant, but that on divergent concomitant strabismus is comparatively scarce.

Historical

Various causes and types of this condition have been described.

Beginning in the 18th century, Troxler and de la Hire thought that strabismus was due to retinal incongruity, *i.e.*, that in one eye the most sensitive part of the retina lay, not on the optic axis, but to one side of it. At this time, of course, the angle gamma was not appreciated, and it was thought that normally the optic axis and the sight axis were coincident.

In the same century, Buffon, who himself had a divergent squint, commented on the frequent presence of anisometropia, and gave it as the most common cause. He said that "the weaker eye" interfered with the binocular vision, and so it turned away. He also said that if the near point was very close, as in the case of myopes, it was tiring to converge sufficiently, and therefore one eye deviated to preserve clarity of vision.

Buffon noticed that in cases of anisometropia the vision in the squinting eye was improved on occlusion of the good eye.

In 1820 Johannes Müller in his book on the "Physiology of Sight" wrote at great length on the causes of strabismus.

In cases of divergent squint he gave as the causes:—

(*a*) *Anisometropia.* In this he quotes Buffon's ideas, and says that a squinting eye develops suppression and so the sight in that eye fails.

* An abbreviated version of this paper was read at the Ophthalmological Section of the B.M.A. Congress at Oxford, July 24, 1936.

(*b*) *Squinting associated with amaurotic eyes.* In this case the cause might lie in a defect of the retina, etc.; it might be due to corneal opacities, or to adhesions between the cornea and the conjunctiva.

(*c*) *Squinting due to what he calls "an unharmonious condition of the eye muscles."* This was apparently a divergence excess, as in these cases the patients squinted in distant vision only.

(*d*) *Bad habits.*

(*e*) *Myopia.* In this condition he considered that there was no accommodation and it was a great strain to converge sufficiently.

(*f*) *Squinting momentarily as the patient changes the distance of fixation.* This he considered to be due to an over- or under-action of a muscle and this condition might be transitory and due to ill-health.

(*g*) *Strabismus incongruous.* Müller said that this type of squint was "inborn and incurable" and was based on a difference in position of the corresponding parts of the retinae. He regarded this as a throwback to animals. From his descriptions his cases may have been those with a false or secondary correspondence, but on the other hand some of them may have been simply apparent squint.

In 1842, Pickford reported a case of alternating divergent strabismus, in which there was no complaint of diplopia; in binocular vision, however, the patient could get physiological diplopia and the squinting eye was normally active. Either eye had good central vision. He considered that a new retinal correspondence had been formed but that this was secondary to and not the cause of the squint, as Müller thought. In Pickford's opinion the cause was due to the fact that the two internal recti could not work together, and therefore the patient could not converge.

von Graefe suggested that in some cases the cause might be due to an abnormal innervation of a muscle, and in other cases it might be due to an actual muscle defect; for example, the insertion might be unusual, or the muscle might be too long or too short. He suggested also that in some cases there might have been a preceding partial paralysis, which recovered, but after which changes in the nerve or the antagonising muscle might be present. Then, again, the convergence powers differ considerably in different individuals, due to the difference in working of the internal recti with accommodation. Weak convergence gives rise to asthenopia, and will forerun a squint.

Whereas Buffon suggested that in myopes it was tiring to converge to the close near point, and Johannes Müller stated that the impulse to converge was lessened as the accommodation was

not used, von Graefe said that myopes require relatively stronger internal recti to converge sufficiently to their near point. He noted that in cases of divergent squint there was an increase in the binocular field of vision. He stated that, in his opinion, diplopia following operation in these cases, as had been previously reported by Müller and Dieffenbach, was not due to the formation of a new correspondence, but to the " lessened eccentricity of the images on the retina of the squinting eye."

In 1864, Donders, in the second half of his paper, " The Pathogeny of Squint," stated that myopia was the cause of divergent squint and asthenopia. He said that a myope required greater convergence than a normal person, but there were various mechanical factors which helped to hinder him from converging. These factors were, that the eye was ellipsoid and its mobility diminished, the centre of rotation was farther from the posterior surface of the sclerotic, and the angle gamma was small. Convergence insufficiency without myopia was also the cause. Any accessory factor which tended to diminish binocular vision would also tend to produce a squint, such as anisometropia, corneal ulcers, etc.

Giraud Teulon pointed out that in the normal person, if diplopia is produced artificially, it is so disturbing that the eye will make necessary movements to overcome it. In his opinion there must be a primary factor preventing the eye from adjusting itself and he considered that this lay in a primary insufficiency of the internal recti.

In 1896, Javal, in his text book on strabismus, dealt with all kinds of squints very fully. He had treated squints with orthoptic training for over 30 years, and had performed many experiments in binocular vision. He noted that the squinting eye was usually the most astigmatic.

Worth considered that the most common cause of divergent squint was myopia, and was due to not giving glasses. He found that in these cases the fusion sense was well developed and the angle of the squint was never constant. The age of development of the squint was later than in convergent concomitant strabismus, although infantile myopic strabismus could occur, but this was rare.

There is another type of which he made mention, *i.e.*, neuropathic divergence, which he said had a family history and developed in infancy; these were not myopic and the fusion sense was feeble.

He also mentioned cases of convergent squint, which, having been treated with glasses, in the course of time became divergent. These he called consecutive divergents and gave no explanation of the condition.

Wootton, in 1916, noted that there were three different kinds of divergent squints:—

(*a*) Those arising from a convergence insufficiency.

(*b*) Those arising from a divergence excess.

(*c*) Those arising from a varying proportion of both.

In the cases of divergence excess he said that hypermetropia was frequent and myopia rare; in cases of convergence insufficiency myopia was frequent and hypermetropia rare; in the third group he said that anisometropia was a common factor.

In cases of divergence excess the deviation was most marked in distant vision, but the convergence was normal. In the type arising from a convergence insufficiency one eye or the other would wander out when looking at near objects.

Duane also described these types of divergent squint; he divided the convergence insufficiency into two types:—

(*a*) Accommodative.

(*b*) Non-accommodative.

The following are his tables showing the production of a convergence insufficiency and a divergence excess.

Convergence insufficiency.

1. Exophoria for near, orthophoria for distance.
2. Divergent for near, exophoria for distance.
3. Increase of exophoria for distance, squint becoming constant.
4. Muscular changes.

Divergence excess.

1. Exophoria for distance, convergence normal.
2. Divergent for distance, exophoria for near.
3. Increase of exophoria for near, recession of near point, squint for near becoming visible.
4. Marked divergence.
5. Muscular changes.

Dunnington, in 1933, adopted the same classification. He said that in divergence excess the divergence is not completely passive, but is due to a simultaneous relaxation of both internal recti, and a contraction of both external recti. Manifest divergence first occurs when the patient is tired, and is followed by a gradual weakening of the powers of convergence.

Of the convergence insufficiency, he said that 60 per cent. are non-accommodative in type.

Most standard text-books state that divergent strabismus is due to myopia, but this is certainly not the case. In the last century myopes were not given glasses at such an early age, or so frequently as nowadays, and perhaps this early correction of myopes has something to do with the fact that myopia associated with divergent strabismus is rare. Also it might be noticed that

Donders wrote his original paper on only 138 cases of strabismus, both convergent and divergent.

My own cases.—For the purposes of classification Duane's headings cover the ground most efficiently. I am therefore using his classification, but I am also including another large group of convergent squints who, without any operation, have become divergent; for this group I am using Worth's name of " consecutive divergence."

In the statistics I am showing, I am, of course, omitting divergence due to a blind eye and following operation for convergent strabismus.

The following table is taken from 88 cases of divergent squint; in 47 cases the primary condition is convergence insufficiency, in 14 cases divergence excess; 10 cases were alternators and 17 consecutive divergence. Of the latter all were convergence insufficiency in type with the exception of 2 cases. It must be noted that the majority of cases arise from convergence insufficiency.

Sex.—In all types the female sex predominated, forming roughly 70 per cent.

Specific fevers.—The occurrence of a divergent squint arising after specific fevers in childhood is rare.

Shock, fright, etc.—No case gave a preceding history of this condition, as is sometimes the case in convergent squint.

Family history (28 per cent.).—A history of convergent or divergent squint was present in only 28 per cent. of cases. Unfortunately, it is sometimes impossible to obtain an accurate family history, and the percentage is probably higher. In 8 per cent. of cases it was impossible to obtain any family history at all.

Mental factor.—The majority of divergent squints, as indeed is the case with all types of squint, occur among the hospital classes. An appallingly large proportion of these squinting children are below the average in mentality, and some of them are definitely mentally deficient. It must be remembered, however, that a fair percentage of children attending our general hospitals have not a very high mental capacity, on the other hand divergent squint does occur among intelligent but highly-strung children.

Refraction.—In divergence excess: Emmetropes 71½ per cent.; Myopes, nil; Hypermetropes, 14¼ per cent.

In convergence insufficiency: Emmetropes, 45 per cent.; Myopes, 17 per cent.; Hypermetropes, 34 per cent.

In alternators: Hypermetropes or emmetropes, 80 per cent.; Myopes, 10 per cent.

In consecutive divergence: Hypermetropes, 100 per cent.

Phorias.—Hyperphoria occurred in 18 per cent. of cases, and double hyperphoria or anatropia, as mentioned by Worth, was noted in 2 per cent. of cases.

Some aetiological factors arising in all groups of divergent squint

	Divergence excess	Convergence insufficiency	Alternators	Consecutive divergence	Total per cent. of all cases
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Number	15⅝	53½	11¼	19¼	88⅜
Sex:					
Male	28½	23½	40	29½	27¼
Female	71½	76½	60	70½	72⅝
	Per cent.	Per cent.	Per cent.	Per cent.	
Age Birth—7	71½	Birth—10 45	Babyhood 20	Age 4 5⅝	
		10—15 8½	3—6 40	9—13 76½	
		Over 15 10⅛		19 5¾	
Not known	28½	36	40	12	
Refraction	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Hypermetrope	14¼	34	40	100	44½
Myope	—	17	10	—	10¼
Emmetrope	71½	45	40	—	40
Mixed astigmatism	7¼	—	—	—	1¼
Myope + hyperm.	7¼	2¼	10	—	3½
Not taken	—	2¼	—	—	—
Phorias	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Hyperphoria	14¼	19	30	11⅜	18¼
,, + torsion	7¼	—	—	—	—
Double hyperphoria	—	4¼	—	—	—
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Amblyopia	7¼	12⅜	—	17½	11¼
Torticollis	—	10⅜	—	11⅜	8
Weak int. recti	—	2¼	10	—	2¼
Anisometropia	—	21¼	10	5⅜	13½
Family history	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
History	28½ (1 con.)	27½	30	29½	22½
No history	57¼	64	66	70½	65
Not known	14¼	8½	10	—	8
Diplopia	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Complained of	14¼	15	—	—	10¼
With red and green	21½	47	30	29½	37⅜
No diplopia	28½	8½	30 (alternated)	23½	23½
Not taken	35⅜	29½	40 (impossible) 1 case M.D. 2 cases below par	47	35

Amblyopia was rare as compared with cases of convergent squint, and occurred in only 11¼ per cent. of the total number of cases. It must be noted that the majority of these cases were those of consecutive divergence, and that in the cases in which divergence was the primary condition the percentage was even less.

Torticollis.—This was present in 8 per cent. of cases and was associated with vertical deviation.

Weak internal recti were associated with the alternators and also in long-standing cases of squint, and was present in 2 per cent. of cases.

Anisometropia was again rare as compared with cases of convergent squint, the refraction in most cases being the same in both eyes.

Binocular vision

(showing comparison between convergent and divergent squints).

Number of cases examined 461.

CONVERGENT 81 per cent. DIVERGENT 19 per cent.

	Unilateral	Alternator	Convergence insufficiency	Divergence excess	Consecutive divergence	Alternator
True correspondence	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1. Binocular vision -	50	23½	55½	65	65	10
2. Macular suppression	8½	12⅜	6	—	5⅜	10
False correspondence	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
3. Binocular vision -	9½	24	8½	—	—	10
4. Suppression - -	5½	27½	8½	—	5⅜	10
True and false correspondence	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
5. Binocular vision -	5½	—	2½	—	11⅜	—
6. Suppression - -	5½	1⅜	—	—	—	—
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
7. Complete suppression	—	—	4½	7⅜	5⅜	—
8. Field suppression -	1½	—	—	—	—	—
9. Panoramic vision -	—	—	2½	7½	—	20
10. ,, + true corres.	—	—	2½	—	5⅜	—
11. Not taken - -	13⅜	12⅜	10½	21½	—	40
12. Total per cent. of all convergent or divergent squints -	85	15	53½	15⅜	19½	11

Diplopia.—On questioning, the patients usually admitted that at some time or other they had had diplopia, and some patients came up complaining of the condition. 10 per cent. of the cases admitted to having diplopia, and a further 37 per cent. of cases obtained diplopia easily when tested with the red and green goggles. Unfortunately, this test can only be performed with reasonably intelligent cases, and it is probable that again the actual percentage of cases which do suffer from diplopia without ever being aware of it, is considerably greater.

The previous table shows the types of binocular vision in 461 cases of squint, of which 373 were convergent and 88 divergent.

Group 1 are those cases in which the maculae are corresponding points, and there is some grade of binocular vision.

Group 2 are those cases which, in binocular vision, suppress a varying area in the region of the macula of the squinting eye, but form no false correspondence; these cases when tested on some instrument for ascertaining the grade of binocular vision, say the pictures cross in space at the angle of the squint, but as they cross the picture in front of the squinting eye is suppressed.

Group 3 are those with a false or secondary correspondence, who have some degree of binocular vision with this false correspondence, in these cases the maculae are no longer corresponding points.

Group 4. In this group the maculae again are no longer corresponding points, and the images do not cross at the maculae, but at an angle less than that of the squint, and where the pictures cross there is an area of suppression.

Group 5 are the cases that had a true and a false correspondence.

Group 6 have complete suppression of the squinting eye in binocular vision.

Group 7 are convergent squints who suppress all the retina with the exception of the nasal fields.

Group 8 are cases of divergent squint who have panoramic vision, *i.e.*, they see simultaneously with both eyes although their maculae are no longer corresponding points, but as there is no overlap of the visual fields there is, therefore, no false correspondence.

Group 9 have panoramic vision when they diverged, but binocular vision with true correspondence when they straighten. Of these I will speak later.

It will be noted from the above table that in convergent squint false correspondence is common, while in divergent squint it is rare. This is rather to be expected, for in convergent squint there is a greater overlapping of the visual fields, and whether

the secondary correspondence is acquired or whether there is some underlying congenital factor, with this increased overlapping of the fields, it is naturally easier for a false correspondence to be formed.

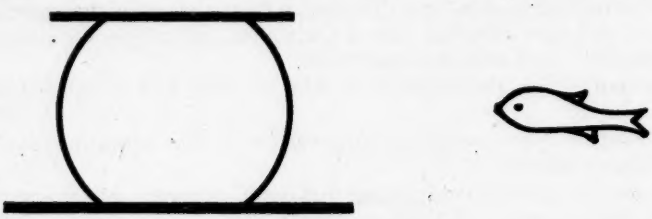
With regard to false correspondence which has any degree of binocular vision, it is never formed more than 10° to 12° away from the macula, and is usually less. In convergent squints there are two types which form this false correspondence, *i.e.*, those unilateral squints with amblyopia, and a certain group of alternators.

In divergent squint, on the other hand, the overlapping of the visual fields is lessened and if a false correspondence is formed it would have to be at such a distance from the macula of the squinting eye, that the vision at this point would be very feeble, and would not be of any advantage, and so far easier to suppress. We also notice another significant factor that amblyopia in divergent squint is far less common than in convergent squint.

Binocular Rivalry.

Before dealing with the binocular vision and treatment of these cases, I should like to mention a little about binocular rivalry, and the so-called simultaneous macular perception pictures.

Now, quite obviously, with a picture such as the fish and the bowl, there may be a complete central suppression in the eye in



front of which is the bowl, and the fish will still appear to be in the bowl, *i.e.*, there is macular suppression and not simultaneous perception.

There are many cases which never form a false correspondence, but have a varying degree of suppression in the squinting eye. Even with a picture such as the bird in the cage, the smallest bird which subtends an angle of 4° may still appear in the cage, but there may be an area of suppression smaller than the bird; if the cage is in front of the squinting eye no bars are seen in front of the bird.

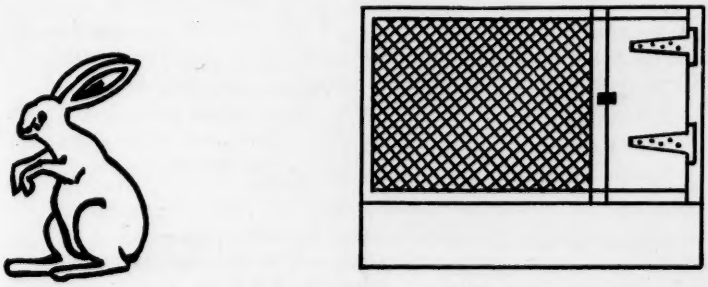
Now it must be remembered that binocular vision normally consists not only of fusion, but of suppression, and when two

dissimilar objects fall on identical retinal points, there is always a tendency to suppress one or the other image, and in people with a master eye this is exaggerated.

With the above dot and cross picture, if this is placed in front of the eyes in a stereoscope the cross appears on the dot, but there is a light area round the dot, due to a psychical inhibition

of the retina in that area, so that the cross can be seen. If one examines carefully a fusion picture with a lock, with normal individuals it is noticed that where the two pictures join there is always a similar lightening.

Most normal individuals can see the bird in the cage with the bars in front of the bird with either eye, unless they have a very definite master eye. If, however, one tests people with the rabbit in the hutch picture from the Cruise stereoscope series, in this case the meshes of the wires are much smaller and the evidence of binocular rivalry is more easily shown. I tested 50 people with normal binocular vision with this picture, and found that they fell into 3 groups :—



1. *Those with fairly equal eyes,* who always got an alternating pattern of rabbit and wires, whichever eye had the rabbit in front of it, and could never see the rabbit with the wires over it.

2. *Those with a master eye* who, when the rabbit was placed in front of the master eye, saw it sitting in front of the

wires (this also occurs in cases of convergent squint). With the cage in front of the master eye, the wires were seen over the rabbit, which was very faint and tended to disappear.

3. *Those who always saw the rabbit in front* with no wires over it, whichever eye had the rabbit in front of it. (This is also seen in cases of alternating squint.)

In binocular vision it must be remembered that appreciation of depth and size, distance, etc., depends not only on the fusion of certain objects, but also on the suppression of other objects, and this is largely a psychological process. Objects are simply ignored if they interfere with a clear conception of the object to be viewed.

In many cases of divergent squint there is an exaggeration of binocular rivalry, and although the patient may have fusion with amplitude, and some degree of stereopsis, with the so-called simultaneous macular perception pictures (as is especially seen with the bird in the cage), they get an alternating suppression, or a central suppression in the diverging eye, and they will sometimes say that the two pictures seem to be entirely dissociated, although they are apparently at the same point in space.

Divergence Excess. 14 cases.

	Per cent.		Per cent.
Age. Birth—7 yrs.	71½	*Diplopia*	
Not known	28½	Complained of	14¼
Sex. Male	28½	With red and green	21½
Female	71½	No diplopia	28½
Refraction		Not done	35¾
Hypermetrope	14¼	*Family history*	28½
Myope	—	Nil	57¼
Emmetrope	71½	Not known	14¼
Mixed astig.	7¼	*Binocular vision*	
Myope+hyperm.	7¼	True corres. and binoc. V.	65
Phorias		„ „ „ mac. suppression	5¾
Hyperphoria	14¼	False „ „ binoc. V.	—
„ +torsion	7¼	„ „ „ suppression	—
Amblyopia	7¼	True and false corres. and binoc. V.	—
Torticollis	—	True and false corres. and suppression	—
Weak internal recti	—	Complete suppression	7¼
Anisometropia	—	Panoramic vision	7¼
		„ and true corres.	—
		Not taken	21½

Age.—If we examine in detail the cases of divergence excess, we find that they occur early in life, *i.e.*, from birth to 7.

Sex.—Approximately 75 per cent. are female in sex.

Refraction.—75 per cent. are emmetropic and none myopic.

In cases where the divergence excess is small, it can pass completely unnoticed by the family; the majority of these cases are an exophoria which has become manifest, and to begin with there is little or no impairment of convergence.

Amblyopia.—This is very uncommon in divergence excess.

Binocular vision.—There is, in most cases, fusion with amplitude and some degree of stereopsis, but they show an exaggeration of binocular rivalry, and with the bird in the cage get an alternating suppression of varying degree, or a complete central suppression of the picture in front of the diverging eye.

If, when testing the binocular vision, the patient is made to fix one picture with the non-squinting eye, and another picture is moved across the temporal field of the squinting eye, the patient will follow it quite correctly with his finger, but on the nasal fields he projects the image as though his eyes were straight, and not diverging. I think the explanation of this is that his muscle sense is faulty, and he does not know when his eye diverges, but when dissimilar objects fall on corresponding retinal points, which they must do when he diverges, he suppresses all except his temporal fields.

Diplopia.—In 14 per cent. of cases diplopia was complained of by the patient, and in a further 22 per cent. a crossed diplopia was elicited by means of the red and green test; the greatest deviation of the images was when the external rectus of the squinting eye was put into action.

Unfortunately, in 35 per cent. of cases it was impossible to do a diplopia test, as the patient was either too young, or too unintelligent.

Exceptions to the general rule were:—

(*a*) A child of 2½ years, who had complete suppression.

(*b*) An adult, who had panoramic vision.

(*c*) A case with marked torsion and hyperphoria, who had suppression in the macular region. In this case the squint was not comitant, and the condition may have arisen from a congenital muscle weakness.

(Since this paper has been written, a case of divergence excess in a myope, with marked anisometropia has been discovered.)

Although amblyopia is rare in all types of divergent squint, very few cases are truly alternating and they always fix with the same eye.

Alternators. 10 cases (1 case M.D., 3 cases below par)

		Per cent.		Per cent.
Sex.	Male	40	*Diplopia*, complained of	—
	Female	60	With red and green	30
Age.	Babyhood	20	Alternated	30
	3—6	40	Impossible to test	40
	Not known	40	*Family history*	30
Refraction			Nil	60
	Hypermetrope	40	Not known	10
	Myope	10	*Binocular vision*	
	Emmetrope	40	True corres. and binoc. V.	10
	Mixed astig.	—	" " " mac. suppression	10
	Myope+hyperm.	10	False corres. and binoc. V.	10
Phorias			" " " suppression	10
	Hyperphoria	30	True and false corres.	—
Amblyopia		—	Complete suppression	—
Torticollis		—	Panoramic vision	20
Weak internal recti		10	Not taken	40
Anisometropia		10		

Unfortunately, of the 10 cases examined, one case was definitely mentally deficient and three cases were below normal intelligence.

Sex.—Again the female sex predominated.

Age.—60 per cent. occurred before the age of 6 years, and in the other 40 per cent. the age of the squint had never been noticed by the parents.

Refraction.—It is again noticed that the majority of cases are hypermetropic or emmetropic.

Muscle weakness.—Definite weakness of the internal recti was only noted in one case.

All alternating squints had, of course, marked divergence excess and convergence insufficiency.

The cases were too few to draw any particular conclusions from, but the following facts must be noted: in cases with true correspondence (two cases of this type were seen), one, a child, had normal fusion, the other, an adult who had squinted from childhood, had a central suppression and no fusion.

In cases of false correspondence, both cases were children, and one was seen immediately after developing the squint at the age of 4 years. This is rather significant, as if the false correspondence played some part in the formation of the squint, rather than being secondary to it. The other case with panoramic vision was an adult, whose angle was 45°.

The remaining cases, unfortunately were too young or too unintelligent, to perform any satisfactory subjective tests.

Convergence Insufficiency. 47 cases.

		Per cent.		Per cent.
Sex.	Male	23½	*Refraction*	
	Female	76½	Hypermetrope	34
Age.	Birth—10	45	Myope	17
	10—15	8½	Emmetrope	45
	Over 15	10½	Mixed astigmatism	—
	Not known	36	Myope+hypermetrope	2¼
Phorias			Not taken	2¼
Hyperphoria		19	*Binocular vision*	
Double „		4¼	True corres. and binoc. V.	55½
Amblyopia		12¾	„ „ „ mac. suppression	6
Torticollis		10¾	False „ „ binoc. V.	8½
Weak internal recti		2¼	„ „ „ suppression	8½
Anisometropia		21¼	False and true corres. and binoc. V.	2¼
Family history		27½	False and true corres. and suppression	—
Nil		64	Panoramic	2¼
Not known		8½	„ and true corres.	2¼
Diplopia, complained of		15	Not taken	10½
With red and green		47	Complete suppression	4¼
No diplopia		8½		
Not taken		29½		

In divergent squints arising from a convergence insufficiency, the angle varies far more than in a convergent squint, and the patient is often conscious of which eye he uses in fixation.

Sex.—Again 76 per cent. are female in sex.

Age.—In the majority of cases the age varies from birth to 10, although a few cases occur in the late teens or early 20's.

Refraction and vision.—These are usually equal and the majority of cases are hypermetropic or emmetropic, although the percentage of myopes is slightly higher in this group than in the others.

Amblyopia is present in a few cases. Large hyperphorias up to 20 to 30 prism dioptres are sometimes found and they are usually associated with torticollis.

Diplopia was complained of in 15 per cent. of cases, and was elicited in a further 47 per cent.

If we examine carefully the factors which produce a divergent squint arising from a convergence insufficiency and consecutive divergence, we find that one or more of the following are usually present.

1. *High hypermetropia.* In this case the relationship between accommodation and convergence is broken down. These cases can be sub-divided into 2 groups:—

(*a*) *Consecutive divergence.* In these cases the previous convergent angle was small, the fusion faculty was normal, they were

very high hypermetropes who had been corrected with glasses and had straightened. After this at ages varying from 7 to 12 they became divergent. It is a significant factor that none of these cases had any convergence amplitude.

(*b*) *In cases of convergence insufficiency which occurred after the correction of high hypermetropes with glasses;* this is later followed by a divergent squint.

2. *Arising from congenital weakness or partial paresis of an oblique or vertical muscle.*—This is probably a more frequent factor than is normally realised. It can sometimes be shown by testing carefully the co-ordinate movements, but in other cases it is only shown in the red and green test for diplopia.

3. *Hyperphorias and torticollis.*—A large hyperphoria will upset mechanically the function of convergence. We may note that in some cases it was found that the hyperphoria only became manifest when the torticollis was corrected.

4. *Following illnesses or in debilitated conditions.*—Although a mild degree of asthenopia and convergence insufficiency often develops during illness, it is usually only a temporary condition, and very rarely develops into a divergent squint.

5. *Mechanical obstructions to convergence.*—

(*a*) *Wide inter-pupillary distance.* It was pointed out by Duane that the true measure of convergence power is the angle through which the eye turns when converging with its fellow, and it will vary as the inter-pupillary distance. Therefore cases with a wide P.D. will have to converge through a greater angle to look at a near object than those with a small P.D.

He gives the true measure of convergence power as:—

$$\tan c = \frac{D}{2PcB}.$$

Where c—convergence power.

D—distance between the visual axes when these are parallel.

PcB—distance from near point of convergence to the base line, running through the pupils.

Two people with the same convergence distance will differ in adduction power as the inter-axial distance differs.

(*b*) *Exophthalmos.*—Exophthalmic eyes tend to diverge, their axes follow the orbital axes and thus interfere with the convergence powers.

6. *Congenital amblyopia.*—This seems to be rare in the production of a divergent squint, when it does occur it is probable that divergence supervenes as convergence falls into disuse.

7. *Anisometropia* of any marked degree occurs rarely. Difference in clarity or size of the two retinal images makes fusion more

difficult, and if uncorrected by glasses there may be some tendency tc suppression of the image in the squinting eye.

8. *Accommodative.*—It is very difficult to assign myopia as the sole cause of a divergent squint, it may be one of the factors that help in the production of the squint, but in all cases some other factors such as hyperphoria or a wide P.D., or as Donders noted, the egg-shaped eyeball, also enters into the production of the squint.

Three myopes developed a divergence some years after they had been treated with glasses, two who developed the divergence at the ages of 13 and 16 were both associated with a large vertical deviation, and complained of diplopia. The third case, a small girl of 9, had a marked torticollis, and when this was corrected the right eye deviated up 8° to 10°, *i.e.*, " strabismus deorsum vergens." These cases could hardly be described as purely accommodative.

9. *Unequal sized retinal images.*—In a certain number of cases, both of convergent and divergent squint, difficulty is experienced in fusion due to the unequal sized retinal images. This occurs in patients who are emmetropic in both eyes, or in cases which have been carefully tested and have accurately fitting lenses. This inequality in size can be shown by means of the pictures designed by Gliddon and Ames. Suitable size-lenses can be fitted to correct this condition, but it is usually found that when the child has learnt to fuse steadily, this inequality in size seems to be overcome without the use of the special lenses.

10. *Following occlusion.*—In convergent squint prolonged occlusion has been followed by a divergence. This is probably due to the fact that convergence falls into disuse and the association between convergence and accommodation is loosened.

11. *Defective fusion centres.*—In cases with true correspondence it is very difficult to decide that the primary cause is due to a defect of the so-called fusion centre; it is much more probable that the fusion has simply fallen into disuse through mechanical obstruction to the requisite movements of the eyes which have to be made in order to enable the macular images to be similar.

In cases with abnormal retinal correspondence there may be some underlying congenital factor in the development of the binocular vision, so that in some cases the binocular vision is like that of a bird of prey and in others it resembles that of a rabbit; the former have four foveae, two for panoramic vision and two for fusion.

12. *Following a purely vertical comitant strabismus.*—Cases of purely vertical strabismus are rare. The above portait is of a girl with a marked torticollis and a vertical strabismus. At the age of 11 she attended a hospital clinic on account of amblyopia in the left eye. On examination I found that she had a purely

vertical comitant strabismus, which did not alter when the torticollis was corrected. This case had a false correspondence situated 5° above the left macula, the true vertical deviation being 15°. After a few months the patient developed a divergent squint.

13. *Following perforating corneal wounds.*—This again is a rare forerunner of a divergent squint, but it does occasionally occur, even when the vision of the injured eye, when corrected by a glass, is practically normal.

Binocular vision in cases of convergent insufficiency

In cases of convergence insufficiency with true correspondence.—The age at which patients first squinted does not seem to be a factor in the preservation of true correspondence, nor does the length of time that the squint has been present. Binocular vision was preserved in all cases with a small angle and little hyperphoria, even in adult life. These cases were probably able to fuse over a certain distance. Cases with a large angle suppressed in adult life.

Cases with a large hyperphoria:—

(*a*) Those who squinted in childhood, had a central suppression.

(*b*) Those who had squinted in adolescence preserved their fusion and complained of diplopia.

Cases of convergence insufficiency with a false correspondence.—The cases who were seen in adult life were accompanied, except in one case, by amblyopia. A case seen as a small girl, had eccentric fixation.

Cases of convergence insufficiency with panoramic vision.—These cases squinted early in life, and were accompanied by

exophthalmos, a wide P.D., and usually had a large angle squint which varied considerably.

One child had panoramic vision when his eyes diverged, and fusion with true correspondence when they were straight. If he was made to fix an object with his right eye, during exercises for fusion training, he could point correctly to an object anywhere in the field of his left eye, but it never overlapped the field of his right eye. If, however, an object was placed in front of the macula of the squinting eye and he was told to observe it, he could see simultaneously with both maculae, but the objects were at some distance from each other in space. The object in front of the squinting eye was then moved towards the object in front of the fixing eye, and the squinting eye would follow this object round until the two visual axes were parallel, and then the two macular images were projected to the same point in space. He fused with some convergence amplitude, and had a low degree of stereopsis.

It is probable that Kries had this same condition; in Helmholtz's "Physiological Optics," Kries mentioned the fact that normally he had binocular vision, but at times one eye diverged, and when he diverged he never got diplopia and he never suppressed. However, he never formed a false correspondence, because, he said, he localised the position of objects in space quite well with either macula, and could see with both simultaneously; if he tried to fix with both at once, however, he suffered from binocular rivalry. His eyes might be compared with those of a chameleon.

Consecutive Divergence—17 cases

	Per cent.		Per cent.
Sex. Male	29½	*Diplopia* complained of	—
Female	70½	With red and green	29½
Age. At age of 4	5¾	No diplopia	23½
9 to 13	76½	Not taken	47
at age of 19	5¾	*Family history*	29½
Not known	12	Nil	70½
Refraction		*Binocular vision*	
Hypermetrope	100	True corres. with binoc. V.	65¼
Phorias		„ „ „ mac. suppression	5¾
Hyperphoria	11¾	False corres. and binoc. V.	—
Amblyopia	17½	„ „ „ suppression	5¾
Torticollis	11¾	„ and true corres. and binoc. V.	11¾
Weak internal recti.	—	Complete suppression	5¾
Anisometropia	5¾	Panoramic	—
		„ and true corres.	5¾
		Not taken	—

Cases of convergence insufficiency with true and false correspondence.—This condition is common in convergent squints but rare in divergent squints. Only one case was observed. She was seen in adult life and had squinted from birth. The vision was normal in both eyes. Binocular vision with a true or false correspondence was very feeble. She had a true correspondence on moving the picture from divergent to convergent and a false correspondence on moving the picture from convergent to divergent.

Age.—The average age at which convergent squints become divergent is 9 to 13 years.

Sex.—Again we notice a predominance of the female sex.

Refraction.—100 per cent. hypermetropes, the majority being high hypermetropes of over 3 or 4 dioptres, accompanied by astigmatism.

Amblyopia.—The percentage of amblyopia is higher than in the other types of divergence.

Hyperphoria and torticollis of a lower degree than those occurring in primary convergence insufficiency are also present.

Anisometropia of any appreciable amount seems to be rare.

Binocular vision.

(*a*) *Cases of consecutive divergence with true correspondence.*—This was present in 65 per cent. of cases, and $5\frac{3}{4}$ per cent. of the cases with true correspondence had macular suppression.

The first case of consecutive divergence which I saw was in a small boy, aged 9. He had a convergent squint of 5° only, was very hypermetropic and amblyopic in the left eye. I occluded the right eye and some 9 months later when I removed the disc, he was diverging 20°.

Of the cases with true correspondence the fact must be stressed, that they had little or no amplitude of fusion.

(*b*) *Cases with abnormal correspondence.*—Two adults, who gave a history of consecutive divergence, had both had convergent squints from birth until adolescence, and had then diverged. Both were associated with nystagmus; one had a false correspondence, the other panoramic vision on diverging and true correspondence on straightening.

Two cases, one an emmetrope, and the other a hypermetrope, had unequal sized retinal images, when tested with the size lenses described by Gliddon and Ames.

Treatment

Glasses are of little use except in the case of myopes; hypermetropes and consecutive divergences are best undercorrected.

Occlusion.—Continuous complete occlusion should be carried out as early as possible in all cases of amblyopia.

Orthoptic treatment.—Very few children are suitable for treatment before the age of 6 years, and most hospital patients are not suitable until even later than this.

There seem to be three types of patients who squint:—

(*a*) Those who do not mind if they squint or not, and are usually of low mental capacity.

(*b*) Those who regard their squint as an asset.

(*c*) Those who want to be cured.

Types (*a*) and (*b*) are hopeless to treat. The third type may be very sensitive about the condition, and thoroughly "soured on life," they are often highly strung and nervy, but their whole outlook on life changes when they are cured.

Types of squint which respond to treatment

The most favourable types are the divergence excess and the consecutive divergence. Less favourable are those with a convergence insufficiency, large hyperphoria, torticollis, etc. Squints with false correspondence are the least favourable, and invariably have to be operated upon. It is better, however, to obtain a steady fusion before operation if possible.

Method of procedure.—Before attempting orthoptic training it should be explained to the patient what is required of him. It never seems to occur to the patients, even those who suffer from constant diplopia, to try and move the images together and pull the eyes straight. I have also had patients who have had some previous training, who have confessed that they have never found out what they were required to do. To get a good result, it is absolutely essential to have active co-operation on the part of the patient.

Stage 1.—The first stage is to make the patient squint-conscious, by breaking down suppression and encouraging diplopia. Red and green goggles are given to the patient, so that he can practise getting diplopia, and then learn to pull the two images together. It is amazing how an adult, in a short space of time, will learn to control a large vertical deviation.

The second way in which to help break down suppression is to make the patient practise with the bird in the cage pictures, until he can see the bird behind the bars with either eye; when this occurs a divergence excess should see double whenever he squints, and he can then learn to correct it.

Some cases have a curious faculty of always seeing one picture nearer than the other, and they have to learn to judge distance correctly. It is partly by means of convergence that we judge distance correctly, and lack of normal convergence may help in causing this factor.

Some patients find it helpful to practise correcting their squint in front of a looking-glass.

The aim and object of all this is to teach patients always to get diplopia when they squint, and then to learn to correct it and not suppress; they must also learn to get physiological diplopia.

Stage 2.—This stage is to improve the fusion power where necessary, and especially to give good amplitude.

The divergence excess must be taught voluntary convergence, and must be able to converge with the Grade 1 pictures.

Stage 3.—This stage is to correlate convergence and accommodation.

It must be remembered that a squint is not cured until the patient can obtain binocular vision at any distance and for any position of the eyes.

Convergence can be encouraged first by making the patient converge with minus spheres, which are gradually reduced. Patients must have a convergence amplitude of from 40° to 60°, and also a good voluntary convergence.

A final exercise is to make the patients converge against prisms, using the Maddox rod and the spotlight; this is, of course, very difficult to accomplish as there is no impulse to fuse.

Cases with false correspondence.—There are many varieties of false correspondence, and the subject is too large to be dealt with here. Briefly, however, the cases which already have some macular correspondence are easier to treat than those which have none. Cases which have any degree of binocular vision with this false correspondence are also very tiresome.

Alternators with false correspondence must be trained, and then operated upon at as early a date as possible. The later a false correspondence is left (*i.e.*, the greater the part of a child's life it has been present) the less are the chances of success with orthoptic training, and the more likely it is to diverge after operation, and relapse to its former false correspondence.

Cases with panoramic vision and true correspondence on straightening do very well with training.

Operations

Operations should be accompanied by orthoptic training before and after the operation if possible.

Luckily, orthoptic training has good results in most cases of divergent squint who have any intelligence, as the operation results are not so good as those for convergent squint. Over-correction must always be aimed at, especially in cases with false correspondence.

Tenotomy of the external rectus gives very little result, and

recession alone is of very little advantage. The best method of procedure is an advancement accompanied by, or without, a recession; but even if the eyes are straight for some months after operation, the squint tends to relapse later.

All patients must learn to co-operate, and they must also learn that the faculty of binocular vision can only be achieved by thinking constantly of using the two eyes together, not only during the time of orthoptic training, but during every waking moment of their normal life.

I would like to thank Mr. Juler and Mr. Williamson-Noble for all their kindnesses to me in the past, and for lending me so many of their beds for my operation cases of squint.

I should also like to mention the fact that the " diplopia goggles " were made for me by Messrs. George Spiller, at a price which is well within reach of all hospital patients.

EXTRA-OCULAR INFLUENCE IN GLAUCOMA*
(constitutional factors)

BY

FARID MASSOUD

CAIRO

IN quoting the words of three different observers, the present-day opinion with regard to glaucoma and extra-ocular influence is best understood.

Wegner[1] describes glaucoma as " an affection that comes not only from the eyes but also from other extensive localities in the organism."

Jameson Evans[2] considers glaucoma " as but the ocular symptom complex of a generalised change." While Terson[3] recommends a glaucomatous patient to be treated as any patient internally diseased.

In point of fact, in the study of glaucoma, the importance must be emphasised of the study of the general body processes going on at the same time in the whole organism. This is not only because of the definite departure from the normal found in certain parts of the body, but also because of the intimate relation that connects them to the local processes going on in the eye.

* Read at the Annual Meeting of the Ophthalmological Society of Egypt, March 26, 1937.

In glaucoma certain pathological changes can be demonstrated in the circulatory, nervous and endocrine systems, which changes possibly appearing on first impression as insignificant, unrelated the one to the other, or even contradictory in some cases, are in reality the connected parts of a continuous chain of events having one source of origin and having one clear significance which further research will make clearer.

In the circulatory system the following changes have been observed:—

(1) Changes in the blood.—Certain elements in the blood are reported to be relatively diminished, *e.g.*, the calcium content—Biffis[4]; others seem to be increased, *e.g.*, the potassium content thus bringing about an increase in the alkaline reserve—Trematore.[5] The chlorides are also stated to be increased as well as the iodine content—Gionnantoni,[6] Passow[7]; on this latter condition, however, some observers mention the reverse.

In the cellular elements of the blood a change occurs in both the red and white blood corpuscles. An increase in the number of the red blood corpuscles has been noted—Passow, while a change in the differential leucocytic blood count also occurs. This change in the leucocytes which consists in a relative increase in the large mononuclears, I have been able to demonstrate since 1929.[8]

In acute cases of glaucoma the large mononuclear leucocytes may attain the remarkable extent of 15 to 20 and even 30 per cent. One noticeable feature in this connection is their apparent independence from any operative relief of intra-ocular tension, their presence seeming to depend not so much on the local condition of the eye as on a general pathological process underlying it, as will be presently explained. Sufficient to refer here to the opinion of Wright[9], who mentions the probable presence in glaucoma of certain toxins interfering with the function of the reticulo-endothelial system. (See the list of counts.)

(2) Changes in the capillaries.—Distinct changes have been observed in the structure and function of the vascular and capillary system in glaucoma patients as evidenced by the increased permeability—Meszaros.[10]

In fact the whole peripheral vascular system is altered and the appearance of glaucoma is but its local manifestation—Rossi.[11] One evidence of this peripheral vascular change is apparent in the curious condition known as " epidemic dropsy " described by Kirwan.[12]

(3) Changes in the blood pressure.—A rise in the average vascular tension has been observed—Rollet,[13] as well as a rise in the venous pressure—Ciotola.[14]

GLAUCOMA

Differential Leucocytic Blood Count on cases from The Giza Ophthalmic Hospital during August to December, 1929

Ticket	Age	P.	E.	S.L.	L.L.	L.M.&T.	Date	History and Remarks
13243	55	54	17	9	15	5	1. 8.29	L. glauc., R. shrunk trephin.
		40	18	7	25	10	27. 8	[26.8
		37	20	—	26	7	29. 8	
		45	13	—	35	7	4. 9	
21031	12	40	20	15	15	10	12.10	Sec. glauc., iridect. 10.10
19611	15	45	12	25	10	8	12.10	Sec. glauc., iridect. 6.10
22210	70	35	6	10	35	14	16.11	Glauc. trephin. 23.10
		54	10	8	20	8	23.11	
25948	40	55	1	25	10	9	3.12	Glauc. subacute 2 months
		50	4	20	6	20	8.12	
		69	1	10	10	10	12.12	R.V. p.l, L.V. 5/60
		73	—	7	6	14	21.12	Iridec. L. 19.12
		70	—	10	8	12	26.12	
26652	30	60	4	14	16	6	12.12	Glauc. 8 months, V. h.m.
		60	5	13	13	9	22.12	Iridec. both 21.12
		64	2	24	6	4	24.12	
		55	3	15	15	12	28.12	
		50	7	15	20	8	31.12	
		45	3	35	7	10	2. 1.30	
		52	5	16	16	11	5. 1	
		65	3	17	10	5	9. 1	
25418	25	65	5	15	5	10	12.12	Glauc. 4 months, V. 1/60
		65	—	10	10	15	19.12	Iridec. 18.12
		60	4	12	3	21	21.12	
		60	5	15	10	10	26.12	
21990	60	30	20	34	10	6	22.12	Glauc. R.V. 5/60, L. no p.l.
		32	13	25	20	10	26.12	Iridec. and trephin. 21.12
		37	5	30	20	8	2. 1.30	
		30	20	35	8	7	5. 1	
25650	25	57	7	20	10	6	22.12	Glauc. R.V. 1/60, L.V. 50 cms.
		42	3	25	20	10	26.12	Iridec. L. 21.12
26773	55	45	12	10	8	25	19.12	Glauc. R.V. h.m., L. 2/60
		50	25	10	5	10	24.12	Under medical treatment
		25	25	10	10	30	28.12	R. trephin., L. iridec. 28.12
		38	30	10	7	15	31.12	
		25	30	20	10	15	2. 1.30	
		55	17	15	5	8	5. 1	Eyes quiet

The nervous changes met with in glaucoma affect the vegetative nervous system, and are connected with vasoneurosis—Weinstein.[15] To begin with an understanding of the normal nervous mechanism is essential.

Under normal conditions, says Gradle,[16] intra-ocular pressure is regulated by variations in the size of the vessels of the choroid and ciliary body, these vessels being controlled by the sympathetic. When arterial pressure rises the sympathetic automatically causes a contraction of these vessels in the eyeball to prevent an overfilling.

When a derangement of this regulatory apparatus occurs as, *e.g.*, a temporary relaxation, then an overfilling of the choroidal vessels is liable to follow a raising in the systemic blood pressure produced by such conditions as, *e.g.*, emotions. The sequelae to this overfilling, *i.e.*, the increase in the contents of the eyeball, the pushing forwards of the lens and iris and the blocking of the angle combined with the continued formation of the aqueous give the necessary requisites to states of rise of tension in the eye.

Thus it is generally conceded that at the root of the glaucomatous change there is a derangement of the sympathetic control of the tension of the eye, but the important point to remember is that this derangement is in fact only a part of a general derangement of the whole vegetative system (nervous), which is usually designated as a disturbance in the equilibrium between the sympathetic and parasympathetic—Heimann.[17]

One evidence of the existence of this general derangement in glaucoma is found in the cases reported by Lagrange,[18] in which he mentions the occurrence of certain visceral pains, uterine and gastro-intestinal in conjunction with a raised tension in the eyes.

Experimentally also, a rise of tension is known to occur in sympathetic irritation—Bistis.[19]

The changes in the endocrine system include a disturbance in the secretion of the thyroid as well as the basal metabolic rate—Passow, Siegert.[20]

A change in the adrenalin also takes place. An upsetting of metabolism is considered by some authors—Duke-Elder[21] as the origin of the special toxins that influence the uvea and cause the acute crisis or rise of tension.

Very much related to this endocrine factor is the influence of emotions already referred to, which make women more prone to attacks of glaucoma than men—Nelander.[22]

Also of interest to note in this connection is the recent report about folliculin as being markedly increased in the urine in correspondence with the increase in the tension of the eye—Dollfus and Seguy.[23]

Significance of these changes.—Coming to analyse these findings one cannot fail to see their clear indication of the presence of a toxin or toxins in the body in cases of glaucoma.

The toxins present in the system constitute the source of origin of all these different changes; their effect on the blood causing its altered condition of diminished calcium, etc.; their effect on the blood-forming tissues producing new cellular formation of large mononuclears, etc.; their effect on the endothelial lining of the capillaries causing the increased permeability, and lastly their effect on the sympathetic and endocrine systems producing the different states of derangement.

Following their natural course of producing vicious circles, these metabolic toxins produce a stimulation in the first stages of their action, followed usually by states of exhaustion through overstimulation, hence the apparent contradiction of observations on such changes as the iodine content or the basal metabolic rate, etc.

The derangement of the sympathetic control of intra-ocular tension is brought about as an accompanying event of this condition of general toxaemia, hence the different manifestations of raised intra-ocular tension.

Practical application.—A clear understanding of extra-ocular influences in glaucoma gives a clear indication of the line of treatment to be followed.

Treatment of the general body toxaemia by elimination should receive the first attention, hence the importance of rest in bed, restricted diet, free intestinal action, diaphoresis and free action of the kidneys—Magitot.[24]

The good results obtained by intravenous injections of such medicines as hypertonic salt solutions or concentrated glucose solutions or others—Gallois and Viard[25]—can be understood as well as the occasional benefit of such drugs as adrenaline or ergotine—Abadie.[26]

Irradiation of the body has been used with rays acting on the vegetative nervous system (Limited rays of Bucky)—Krasso.[27]

Irradiation has been also used for the thyroid with an improvement of vision and visual field.

Insulin was also made use of to produce a fall in tension—Bellavia.[28]

The increase in the large mononuclear cells of the blood might be made use of as one of the early signs which, in conjuction with others, helps in the diagnosis of suspected glaucoma.

In conclusion, one cannot help being impressed by the optimistic opinion of many observers, who mention the future possibility of preventing and even treating conditions of primary glaucoma in their earlier stages on dietetic and general lines with advance of biochemistry and bacteriology.

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ANNOTATION

"Mors ultima linea rerum est"

In spite of Horace's dictum which we take as our title there have been many instances in history in which the dead have served the living. In more primitive times the manner in which this was achieved was often crude, for instance, in military engagements the dead were sometimes made to serve as decoys or used as protection for the hard pressed defenders.

In one of Caesar's Gallic wars a barbarian leader hemmed in by a besieging Roman army and hard put to it for food supplies appealed to the aged to sacrifice their lives for the ideal of nourishing those who were young and had to resist the enemy, and even in Napoleon's retreat from Moscow the dead served in a nutritional rôle.

With the march of science other means of utilizing the material of the dead for the needs of the living have been elaborated. In the Great War 1914-1918 there were rumours that human corpses were being utilized for the extraction of animal fats. To-day there is in Moscow a well organized blood transfusion service which utilizes the blood of cadavers to supply the living. To Professor

W. N. Shamov and Professor S. S. Yudin must go the credit for their research work which has made this procedure a safe practice. Soon after death two litres of blood may be withdrawn from the jugular vein and preserved for several weeks at ice-box temperature. The blood is a suitable colloidal fluid, retains its rôle as an oxygen carrier and seems to produce a less hostile reaction and a better stimulus to new blood formation than living blood. Professor Shamov has disposed of the bogey of harmful cadaveric toxins. The surgical and accident department of the Sklifosovsky Institute in Moscow has now at its command large quantities of blood available for immediate use, day or night, and sufficient to serve the needs of a city of four million inhabitants.

Also in Russia there has arisen a service for the supply of cadaver's eyes for the purpose of transplantation of the cornea. Filatov has achieved some success by utilizing corneal grafts cut from a cadaver's eye which has been removed soon after death and preserved in the cadaver's fresh clotted blood or citrated blood at ice-chest temperature of 4° to 6° C. In one case transparent union resulted from a graft taken from an eye which had been preserved for six days, but in most cases the eyes had been preserved for 10 to 56 hours. (Some of the technical details and results were given in an abstract on p. 510 of the September number of this Journal.)

At first certain difficulties in obtaining the necessary material from cadavers had to be overcome. To the primitive mind the blood is the bearer of mystic qualities and the Russian has an instinctive fear of giving away something so valuable. To some persons there is also a distaste for disturbing the repose of the dead.

In this country it is unlikely that these objections would be raised at least by that section of the community among whom cremation is desired, and the idea that even post-mortem they could render some service to suffering humanity would appeal to them and make their passing not altogether devoid of some satisfaction.

ABSTRACTS

MISCELLANEOUS

(1) **Jablonska, Z. (Warsaw).—Autogenous vaccinotherapy in suppurative lid affections. (Autovaccinebehandlung eitriger Liderkrankungen).** *Klin. Monatsbl. f. Augenheilk.*, Vol. XCVII, p. 362, 1936.

(1) **Jablonska** strongly recommends autogenous staphylococcus vaccine therapy in blepharitis. Injections are made subcutaneously

or intra-muscularly, beginning with 0·2—0·5 c.c. and working up to 1 c.c., the concentration being 500 millions per c.c. At the beginning the intervals are 3-5 days; when the full dose has been reached the intervals can be lengthened to 8-14 days. From 10 to 20 injections are needed. In stye-formation gluteal injections are to be preferred; in ulcerative blepharitis, injection into the skin of the lids is the more effective. Other measures are not to be neglected (antivirus Besredska and paintings with 1 per cent. brilliant green in 50 per cent. alcohol).

ARNOLD SORSBY.

(2) **Lenz, G. (Breslau).—Eye disease treated by radium emanation locally. (Lokalbehandlung von Augenleiden mit Radiumemanation).** *Klin. Monatsbl. f. Augenheilk.*, Vol. XCVII, p. 216, 1936.

(2) **Lenz** reports on the results obtained by radium emanation in a series of ocular lesions. Gaseous emanation is not well tolerated; solutions and ointments are to be preferred. When the preparations employed do not contain more than 300 E. S. E. per c.c., no deleterious effects are to be feared from such few of the β and γ rays as are present in addition to the α rays, For the past $3\frac{1}{2}$ years he has treated about 300 patients, mostly by means of ointment in the conjunctival sac. Good results were obtained in chronic eczema of skin of the lids, even when secondary atrophy and distortion were present. Inflammation of the lid margins was generally unaffected, though rapid improvement was occasionally obtained by the application of ointment of 25-100 E. S. E. strength. Scrofulous ophthalmia and its consequent scar-formation of the cornea gave no response, nor did old corneal scars. In interstitial keratitis emanation should only be used when the disease is no longer actively progressing; yellow infiltrates and fully developed ulcers of the cornea are contra-indications. In quiescent corneal dystrophies it is useful, and is particularly so in trachomatous pannus, though trachoma follicles are uninfluenced.

ARNOLD SORSBY.

(3) **Blobner, F. (Prague).—The effect of sympathectomy in optic atrophy and pigmentary degeneration of the retina. (Ueber die Wirkung der Sympathektomie bei Sehnervenatrophie und Pigmentdegeneration der Netzhaut).** *Klin. Monatsbl. f. Augenheilk.*, Vol. XCVIII, p. 289, 1937.

(3) **Blobner** reviews a number of cases in which sympathectomy was performed in an attempt to improve vision. In eleven cases there was no definite improvement of visual field or of vision and in one there was a serious decrease in both, following the operation. There was no visible increase in the calibre of the retinal vessels

and the Bernard-Horner syndrome was seldom found. The author has decided to abandon the operation in future as it is by no means harmless.

D. R. CAMPBELL.

(5) **Velhagen, K. (Halle).—Observations on ocular lesions in endocrine disturbances. (Einzelbeobachtungen ueber Störungen der innere Sekretion und Auge).** *Klin. Monatsbl. f. Augenheilk.*, Vol. XCVI, p. 577, 1936.

(5) **Velhagen** reports in detail four cases of eye disease in which endocrine disturbances were present: (1) glaucoma in association with hyperthyroidism and acromegaly; (2) retinitis pigmentosa developing late in a man aged 61 years, suffering from pernicious anaemia; (3) keratoconus developing acutely in a woman aged 38 years, suffering from various trophic disturbances possibly due to disorders in the thyroid and adrenals; (4) tapeto-retinal degeneration in a case of pituitary tumour. The theoretical possibilities are discussed.

ARNOLD SORSBY.

BOOK NOTICE

Internal Diseases of the Eye and Atlas of Ophthalmoscopy. By MANUEL TRONCOSO, M.D., Consulting Ophthalmologist, Meadowbrook Hospital. Philadelphia: F. A. Davis Company. Pp. 511. Illustrations 238. 1937. Price, 15 dollars.

This book has been written for the ophthalmologist, the internist and neurologist. The author has presented his subject in a manner that is lucid and attractive. From a careful survey of pathological and physiopathological changes he deduces the main symptoms for the lesion under description. Diseases of the eye and particularly those of the fundus oculi afford excellent material for teaching in this manner. The pathological changes taking place in a lesion are readily observed from time to time and correlated with their effects on the function of the eye. Sometimes opportunities occur for completing the investigation with a histological examination of the lesion, and perhaps the best feature in this book is the admirable manner in which the author has presented on the same page a fundus painting of a particular lesion, with its histological appearances on section. In some cases diagrams explain the nature of the fundus picture.

Except for the fundus paintings of angiomatosis retinae, lipaemia retinalis, retinitis circinata and a microphotograph of glioma retinae the illustrations are excellent. In the description of the treatment

of glioma retinae it is regretable that radium has been allocated to the treatment of inoperable cases and for the alleviation of pain and that no mention has been made of the work on the treatment of glioma retinae in the second eye which was begun in England by Foster Moore and has been carried on successfully.

The book contains chapters on the ophthalmoscope and its uses in the examination of the eye; and on the visual fields, perimetry and scotometry. A special chapter has been allotted to the retinal circulation, and others deal with diseases of the retina, choroid, vitreous body and injuries of these structures.

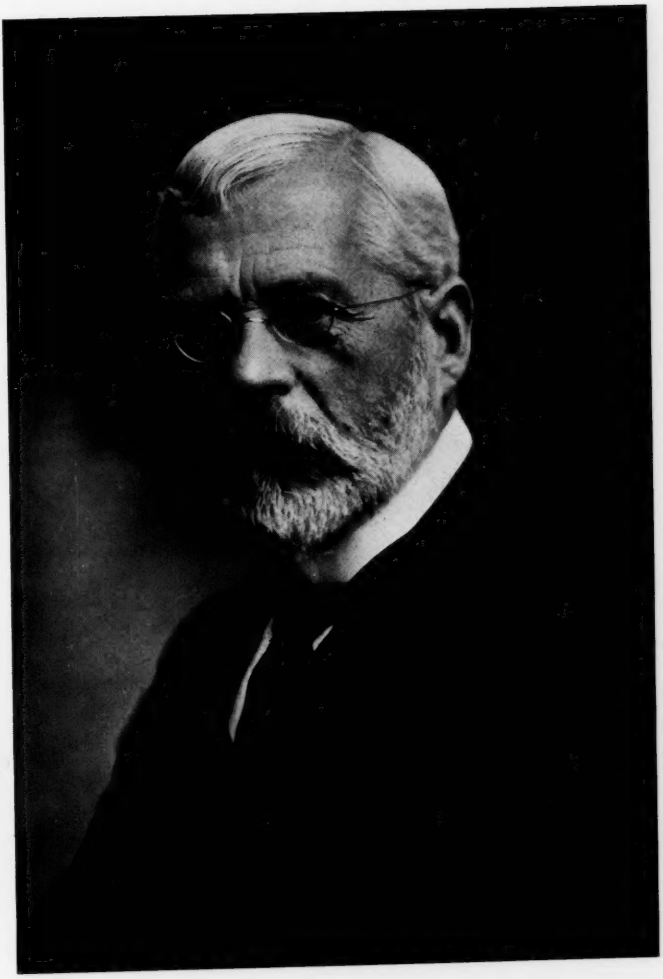
This book should prove of considerable value to ophthalmologists, internists and neurologists. It is admirably written. The type, paper, illustrations and binding are well produced.

OBITUARY

WILLIAM LANG

It is with regret that we report the death of Mr. William Lang, on July 13, at the age of 84. He had been in fair health, although feeble, and it was during a stay at Crowborough that he developed a chill that caused his death in a few days. Born in Exeter on December 28, 1852, he was the son of Isaac Lang. He was educated at the Moravian School in Lausanne and acquired a good working knowledge of French and German. In 1870 he entered the London Hospital, at the age of 18, and qualified as M.R.C.S. in 1874. He became F.R.C.S. in 1879. He served as House Physician and House Surgeon, and later on was demonstrator of physiology and anatomy in the Medical College. Here he met J. E. Adams, and so was directed to ophthalmology. He became Assistant Surgeon to the Central London Ophthalmic Hospital in 1879, Ophthalmic Surgeon to the Middlesex Hospital in 1880, and followed Adams at Moorfields in 1884, to whose practice he also succeeded. He was one of the 113 founders of the Ophthalmological Society, and his death leaves only three original members, Sir Thomas Barlow, Sir George Berry and Sir Lindo Ferguson. He was senior Vice-President in 1903 and acted as President owing to the death, during office, of Dr. David Little. In 1916 he acted as President of the Ophthalmological Section of the Royal Society of Medicine.

He married first Susan, daughter of the late W. T. Buckland, of Auckland, New Zealand, and lived for a time at Wood Green, but



WILLIAM LANG

UNIV. OF MICH.

moved in 1885 to Chiswick. By this marriage there were a son and daughter. The son, Basil Thorn, followed his father in ophthalmology and was a man of exceptional ability and originality. He became a member of the staff at Moorfields in 1923 and died in 1928 at the age of 47 after a short illness. Secondly, he married Isabella Jane, widow of A. M. Dunlop, who died in 1927.

Whilst a resident in Chiswick, he was a neighbour of William Morris, and he made a collection of the books published by the Kelmscott Press. In 1892 he removed to 22, Cavendish Square, which was to remain his home until within a short time of his death when he removed to 35, Cavendish Square.

Lang was not a prolific writer. Both writing and public speaking he found difficult, and he went through agonies of mind if he had to make a speech or take part in a public function. Nevertheless, his output was considerable, and his more important publications were of great value. From 1881, when he became one of the founders of the Ophthalmological Society, until 1906 the records show that he often brought cases forward and joined in discussions. In 1882 he published, with W. A. Fitz-Gerald, a paper on the movements of the eyelids in association with the movements of the eyes. This was his first paper of note and in it the action of the inferior rectus muscle in the downward movement of the lower lid is proved. Sir William Gowers had previously stated that the lower lid was depressed by the pressure of the limbus upon the margin of the lower lid. After the paper had been written the authors discovered that Bonnet and Richet had described the action of the inferior rectus muscle 40 years previously. In 1886 he was a member of the Committee which reported on 211 cases of sympathetic ophthalmitis. In 1887 he published his account of the insertion of an artificial globe into Tenon's capsule after excising the eye. This operation had been independently suggested by Adams Frost in the previous year. In 1888 he described the condition of the ciliary processes and suspensory ligament of the lens after removal of the iris. In this case the iris had been torn away by an accident, and the eye was otherwise normal. Lang was unable to see any result from the application of atropine or eserine in the eye, although the eserine produced a characteristic pain in the eye. In 1889 he offered an explanation of enophthalmos following a blow upon the eye, which retained full visual acuity, by suggesting that the orbital sac had become herniated into the antrum of Highmore. In 1892 he showed a case of chancre of the semilunar fold of conjunctiva which was followed by interstitial keratitis in the affected eye. In 1895 appeared his only book "The Methodical Examination of the Eye." It was put out as Part I of a guide to the practice of ophthalmology for students and practitioners. At various times in later life he made efforts to write further volumes which were to

include one on operative surgery. For this some photographs were taken of him operating.

In 1895 he also took part in the discussion on the operative treatment of myopia by removal of the crystalline lens. He pointed out the tendency to detachment of the retina following the removal of senile cataract in myopic patients. It was the experience he gained in needling the lens in high myopia and the subsequent removal of the softened lens matter that led him to devise the incision in the upper part of the cornea midway between the limbus and the centre of the cornea, so as to avoid prolapse of iris and also permit the detachment of any capsular synechia which might follow and for which he devised his well known twin knives in 1889.

He was the first to prove that the iridescent crystals seen in a senile cataract were typical cholesterin crystals.

Lang was for many years the editor of the *Royal London Ophthalmic Hospital Reports*, and he contributed several important papers in collaboration with Sir James Barrett, who was then living in London. The first was in 1886 on "The Refractive Condition of the Eyes of Mammalia." A great variety of animals were examined, 185 eyes in all, and the majority were hypermetropic. In the same year appeared a long and elaborate paper on the action of miotics on the accommodation. This was a continuation of Donders' work published in 1864. In 1887 they published a paper that had considerable practical importance, as it is upon the information contained in it that the use of cycloplegics in refraction work is built. This paper was "The Action of Myotics and Mydriatics on the Accommodation." It is the record of a patient and careful investigation, and in it was introduced an enquiry into the action of a mixture of homatropine and cocaine (often known as Lang's drops), and of the extremely ingenious oily solution of these alkaloids. It was also shown in this paper how easily and safely the action of these drugs can be controlled by the subsequent use of eserine. The last paragraph in the paper announces "After paralysis of the sphincter pupillae and ciliary muscle has been effected by the application of homatropine or of homatropine and cocaine, the application of eserine causes a constriction of the pupil, and an approximation of the near point to such an extent that in the great majority of cases the individual can, in a few minutes, resume work of all kinds without inconvenience."

In 1888 appeared two papers on convergent concomitant strabismus in which were considered the results of treatment of convergent strabismus by the correction of the refraction error with and without tenotomy: the possibility of alteration of vision in the squinting eye: familial tendency to strabismus: age of onset and

alleged causes: whether amblyopia is the cause of strabismus, and the influence of atropine on concomitant convergent strabismus.

In 1889 Lang published, with Casey A. Wood, an examination of the patellar tendon reflex in sixty-two cases of interstitial keratitis. It was absent in 10 per cent. and "decidedly abnormal" in 30 per cent.

Lang had always the practical side of ophthalmology in view, and here he was a master. He improved many of the instruments in common use. The McHardy perimeter, until it was superseded by better models, was improved by him in many ways. The speculum with solid blades is still in common use, and his twin knives for dividing anterior synechiae mark an epoch in the improvement in cataract extraction, as by them he drew attention to the importance of avoiding the inclusion of lens capsule in the wound. It took many years for this sound teaching to sink in, but nowadays, everywhere, whether cataract be extracted in the capsule or extracapsularly, great pains are taken to avoid that annoying and sometimes dangerous complication.

Another matter that will always be associated with Lang's name is the importance of focal sepsis in inflammatory diseases of the eye, and the elimination of focal sepsis as far as possible before operations on the eye are undertaken. Lang's attention was drawn to the consideration of oral sepsis by Mr. William Hern. Mr. Hern had noted the frequent co-existence of oral sepsis and rosacea, and Lang had been one of the earliest to note the connection between keratitis and rosacea. From this hint Lang began to preach the danger of oral sepsis and although others carried the matter to extremes, few will deny how important is focal sepsis in connection with eye disease.

As a clinical observer and all round ophthalmologist, Lang was unsurpassed in his day. His operating and his resource in difficult cases will always be remembered by those who had the good fortune to be his house surgeons. He had a peculiar nervous tremor of the hands that was always present, but it in no way, at any rate until he became old, interfered with his operative skill. He had about 6 D. of myopia and when he operated always put his spectacles on his forehead by lifting them with his little finger, and then, with his own eyes near to the eye upon which he was operating, seemed to see everything, much of which had escaped the notice of others.

As a clinical teacher he will always be remembered. All his students were "dear boys," and with them he was extremely popular. His more serious pupils who were to be ophthalmic surgeons owe very much to him. How characteristic was his examination of a patient at the out-patient desk, with spectacles on forehead, noticing a lesion missed by many, which he was often pleased to designate—Brobdingnagian.

He was extremely patient and courteous to everyone, and his most cherished expletive, which he saved for moments of greatest provocation was—"Dash my wig."

When he resigned his appointment at the Middlesex Hospital his many old students gave him a complimentary dinner at which the late Sir Henry Morris presided.

Lang lived 25 years after he had retired from active hospital work; he did not, therefore, come into contact with the younger generation of ophthalmic surgeons, and his great services to ophthalmology are apt to be overlooked. Those of us who worked with him and remember him, often have his name upon our lips when we meet one another, and we will always remember that dapper little man, always good tempered, always courteous, always full of sound advice, especially in difficult cases: and when we all foregather in the Elysian fields there will be one pleasure that we will wish—to see him again perform a glaucoma iridectomy.

Mr. Lang was devotedly cared for by his daughter in his later years, and to her, the sole survivor of the family, we offer our sympathy and at the same time express to her our thanks and admiration for all her goodness to him.

NOTES

International Organization against Trachoma

DURING the period of the XV Concilium Ophthalmologicum to be held in Cairo from December 8 to 14, 1937, there will be sessions of The International Organization against Trachoma.

On Thursday, December 9, there will be a meeting of the present Executive Committee; this will be followed by a plenary meeting of the Delegates from the National Ophthalmological Societies together with the subscribing Members of The International Organization against Trachoma.

The names of such Delegates should be notified to the President of The International Organization against Trachoma at 33, Welbeck Street, London, W.1, thirty days before the opening of the Congress. Notices to this effect have already been addressed to each Society.

The programme of the scientific sessions is as follows:—

(1) Introductory Address by the President, Mr. MacCallan.

(2) The Microbiological Aetiology of Trachoma;

Reporters—Dr. Phillips Thygeson (U.S.A.), Professor Dr. Grüter (Germany), Professor Dr. Oguchi (Japan), Drs. Cuénod and Nataf (Tunisia), Dr. Rötth (Hungary), Dr. Poleff (Morocco).

(3) The Pathology of Trachoma;
Reporters—Dr. Wilson (Egypt), Professor Dr. Michail (Rumania), Professor Dr. Mulock-Houwer (Dutch East Indies), Professor Dr. Pascheff (Bulgaria).

(4) The Treatment of Trachoma:
Reporters—Dr. Sobhy Bey (Egypt), Dr. Shimkin (Palestine).

(5) Independent Communications:
Professor Dr. Motegi (Japan): "The epidemiology of trachoma in Japan."
Dr. Lijo-Pavia (Argentina): "Trachoma among school-children in Buenos Aires."
Dr. Ayberk (Turkey): "Trachoma in Turkey."

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Appointment

Mr. F. A. WILLIAMSON-NOBLE has been appointed Ophthalmic Surgeon to the National Hospital, Queen Square.

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XVth International Congress of Ophthalmology, Cairo, 1937

AS noted in our June number the Council of the Ophthalmological Society of the United Kingdom has authorized Thomas Cook & Son, Ltd., to undertake the necessary hotel and travelling arrangements for members who wish to attend the Congress.

We have received from Thomas Cook & Son, Ltd., a copy of their programme. The following is a brief résumé of the itinerary:

Dec. 2. Leave London (Victoria) *via* Dover and Calais, 11 a.m.
Dec. 3. Arrive Marseilles. Embark on S.S. "Mariette Pacha."
Dec. 7. Due at Alexandria. Train to Cairo.
Dec. 8—14. Congress in Cairo.
Dec. 15. At leisure in Cairo.
Dec. 16. Sight-seeing, Cairo, The Pyramids, Sphinx.
Dec. 17. Leave Cairo for Alexandria to embark on S.S. "Mariette Pacha."
Dec. 21. Arrive Marseilles.
Dec. 22. Arrive London (Victoria).

A table of inclusive fares for each passenger is appended. These range from £48 single room at the Semiramis and £57 for a room with private bathroom at the same hotel to £43 12s. for similar accommodation at the Metropolitan. A choice of five hotels is given. Further information can be obtained from Thomas Cook and Son, Ltd., Berkeley Street, London, W.1, and Cairo, near Shepheard's Hotel, to whom an early application is advisable.

FUTURE ARRANGEMENTS

1937

October 1.—Midland Ophthalmological Society, at the Eye Hospital, Birmingham *(Annual Meeting)*.

October 22.—North of England Ophthalmological Society, at Manchester.

November 19.—North of England Ophthalmological Society, at Bradford.

December 7.—Midland Ophthalmological Society, at Birmingham Eye Hospital (Middlemore Lecture).

December 17.—North of England Ophthalmological Society, at Leeds.

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February 4.—North of England Ophthalmological Society, at Newcastle-upon-Tyne.

March 4.—North of England Ophthalmological Society, at Liverpool.

April 1.—North of England Ophthalmological Society, at Sheffield.

CONTEMPORARY OPHTHALMIC LITERATURE

Archives of Ophthalmology. *August, 1937.*

JAMESON EVANS, P. Atrophy of the optic nerve and naevus flammeus associated with hemangioma of the choroid: report of a case.

COOPER. The jaw-winking phenomena: report of a case.

SPACKMAN. Localization of intra-orbital foreign bodies.

WRIGHT. Isolation of Verhoeff's leptothrix in a case of Parinaud's syndrome.

CARLETON and MADIGAN. Relationships between aniseikonia and ametropia, from a statistical study of clinical cases.

SPAETH. Light adaptation at the macula.

MCLEAN. Astrocytoma (true glioma) of the retina: report of a case.

HUBBARD. Treatment of caustic burns of the eye.

SPRATT. Primary carcinoma of the lacrymal sac.

American Journal of Ophthalmology. *August, 1937.*

ADLER. Bilateral partial colobomata of the optic nerve.

FIELD, TAINTER, MARTIN and BELDING. Studies on the oxygen consumption of the rabbit lens and the effect of 2—4 dinitrophenol thereon.

FRALICK. Luxation of lens through a retinal tear into the subretinal space.

FERREE and RAND. The testing of fitness for night flying: the light sense.

CLARK. The treatment of seborrheaic blepharoconjunctivitis.

KLIEN. Concerning conditions simulating an intra-ocular tumour.

KNAPP. Spontaneous rupture of the lens capsule in hypermature cataract causing secondary glaucoma.

BOTHMAN. Refractive errors in the same eyes under scopolamine and under atropine cycloplegia.

Annales d'Oculistique. *July, 1937.*

CUÉNOD and NATAF. New experimental researches on trachoma.
KAPUSCINSKI. Ocular pemphigus.
ROBERT. The chalazion. Its true nature. Its relation with the ametropias.

August, 1937.

HARTMANN, DAVID and DESVIGNES. Ocular symptoms in olfactory meningioma.
HUDELO. The prescription of prisms in current practice.
NIZETIC. Deep sutures.

Revue d'Oto-Neuro-Ophtalmologie. *June, 1937.*

JAYLE, PAILLAS, JOUVE and BOUDOURESQUES. Pseudo-tumoural encephalitis with ocular and auditory troubles.

Revue d'Optique. *August, 1937.*

LE GRAND. Research on the diffusion of light in the human eye.

Archiv für Ophthalmologie. *137 Band, 3 Heft.*

HERZAU, WERNER and OGLE. The differentiation of the form of both eyes in asymmetrical convergence and its significance in binocular vision.
CUSTODIS. The essential conjunctival atrophy of human eyes.
HAMBURGER. Tularemia oculo-glandularis.
LAUBER. The enlargement of the erect ophthalmoscopic image of emmetropic eyes.
UYAMA. The occurrence of the so-called "Thrombo-angiitis obliterans" of the eye with regard to anatomical examination.
SUGITA. The nature of spontaneous retinal detachment, with special notice of the physico-chemistry of its mode of origin.
CAVKA. A contribution to anterior and posterior vitreous detachment.
KYRIELES. Brief comments on papilloedema.

Klinische Monatsblätter für Augenheilkunde. *August, 1937.*

BÜRKI. Pupillary tone.
WÖLFFLIN. Improvement of the sight and enlargement of the visual fields after operation for pituitary tumour.
JUBA and SZATMÁRI. Rare anatomical brain conditions in cases of unilateral peripheral blindness.
ZAVALIA, ALLENDE and OLIVA. Scleromalacia in the course of a chronic porphyrinuria.
GÖRDÜREN. Contribution to the explanation of tearing of the iris after contusion of the eyes.
COLENBRANDER. New test sheet for the determination of visual acuity.
OLOFF. A simple lantern apparatus for practical requirements in the examination of the red-green and blue-yellow colour sense disturbance with inclusion of the colour threshold and of the light sense test.
LINDEMAN. Does colour incompetence appear through neophane glasses?
DERKAC. Treatment of trachoma by restraining secretion.
KEPPICH-OLÁH. Treatment of trachoma.

Archivio di Ottalmologia. *March-April, 1937.*

CAVALLACCI. Influence of the light stimulus on the retina in glycaemia. (Experimental research).
COSSU. Action of the photodynamic treatment on experimental tuberculosis of the eye.
CAVALLACCI. Comment on Schupfer's observations "about some works on retinitis pigmentosa."
CORDERO. Action of α dinitrophenol on the eye. (Experimental research).

Annali di Ottalmologia e Clinica Oculistica. *December, 1936.*

GALLERANI. A sphero-concave glass to correct and measure hypermetropia.
CORRADO. The behaviour of the ocular tissues under the action of chemical and pharmacological substances introduced into the anterior chamber and the vitreous. (Experimental and histo-pathological research).
MECCA. Contribution to the study of Fuchs' heterochromia.
PATERNOSTRO. Megalocornea. (Clinical contribution and pathogenetic considerations).
FIORE. Is there vitreous compensation?

Bollettino d'Oculistica. *June, 1937.*

SCHUPFER. The unilateral form of retinitis pigmentosa.
PAGANI. More about the operation for cataract.
SALA. Epithelial turbidity of the cornea, recurrent and transitory.
LIESCH. Contribution to the knowledge of the pupillary reactions in man. (1) Some particular effects of prostigmine on the motility of the pupil.
NASTRI. Research on the dehydrogenative processes of the retina after the resection of the optic nerve.
MARUCCI. Bullous keratitis and epithelial dystrophy of the cornea secondary to cataract.
CIOTOLA. Contribution to the knowledge of argyrosis of the lacrymal passage.

Bulletin de la Société Belge d'Ophtalmologie. *August, 1937.*

DANIS. Corneal grafting.
KLEEFELD. Non-mutilating medial blepharorrhaphy.
KLEEFELD. Annular opacities of the vitreous body.
WAUTERS. The retinal artery in Raynaud's disease.
FRITZ. Granulations of the retinal vein.
WIBO. Fistular sclerectomy in severe forms of atypical ulceration.
WEEKERS and FANCHAMPS. Late tension results obtained by iris inclusion in various forms of glaucoma.
JOIRIS and WEEKERS. Benign ophthalmic phlebitis of dental origin.
WEEKERS. Allergic paroxysmal oedema of the globe. Its relation with intermittent corneal oedema.
ZANEN. Extraction of a sub-conjunctival filaria.
FRANÇOIS. Biomicroscopical study of the normal lens in a rabbit.
BRENTA. About several narcoses with sodium evipan in ocular surgery.

Archivos de Oftalmologia de Buenos Aires. *May, 1937.*

PAVIA. Rare ophthalmoscopic aspects caused by the refraction of intra-ocular crystals.
GALLINO and RÉ. Cinematography in a case of Marcus Gunn's phenomenon.
VON GROLMAN. The bitemporal hemianopsia of myopia.
PAVIA. Retinal detachment. A new transilluminator.

Revista Cubana de Oto-Neuro-Oftalmologia. *Nov.-Dec., 1936.*

FERRER. Topography of retinal detachmont.
PENICHET. Modern conception of ocular hygiene.

Anales de la Sociedad Mexicana de Oftalmologia y Oto-Rino-Laringologia. *April-June, 1937.*

ICAZA. Ocular lues in relation to neuro-luetic infections and their treatment.
AVALOS. Trauma to the extremity of the eyebrow and its consequences on the eye.
ISASSI. Commentary on former work
CHAVIRA. Ocular complications in some cases of sinusitis.